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The Dillow's Ridge Site and the Production of Mill Creek Chert Tools

Brian M. Butler and Charles R. Cobb

The Dillow's Ridge site (11U635) is a small Mississippian village situated on an unplowed hill-top near the largest known Mill Creek chert quarry in Union County, Illinois. The site was both a permanent residential settlement and a major workshop where Mill Creek chert tools were produced for nonlocal use. Radiocarbon dates document the occupation from the late 1200s A.D. to A.D. 1450 or 1500. The production debris and rejects indicate that the major "export" products were hoes and Ramey knives. Although the quantity of lithic debris on the site is very impressive, estimates of annual production of large biface implements are in the hundreds per year and not thousands. This level of production was easily attained by part-time specialists within a small community without major distortion of normal domestic and food-getting activities. Production and trade of these implements was also not a source of significant prestige or wealth for the producers.

Hoes and other large bifaces made of Mill Creek chert have been known to archaeologists for over a century as one of the most important trade items of the Mississippian period in the central Mississippi and lower Ohio valleys. Indeed, Mill Creek hoes and hoe fragments are so abundant in this area that they constitute one of the diagnostic artifact types for the late prehistoric era. Their ubiquity also attests to the importance of digging implements in the Mississippian tool kit. The wide distribution of Mill Creek chert hoes and other tools raises important questions about the organization of their production around the source areas in southern Illinois.

One of the more contested issues in Mississippian political economy is the nature of production specialization (cf. Muller 1984, 1987; Pauketat 1997; Yerkes 1983, 1989). The debate over specialization is pitched at two interrelated levels. First, there is the broader question of the relationship between specialization and the organization of political complexity (Clark and Parry 1990; Cobb 1993; Costin 1991). Second, there is the more substantive issue of reconstructing the social context of production within a given setting. It is the latter issue we address here. In this paper we summarize the work undertaken by Binghamton University (New York) and Southern Illinois University Carbondale in the Mill Creek locality in southern Illinois, with special attention to the Dillow's Ridge site (11U635), a small residential settlement where significant Mill Creek chert biface production took place. This un-

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plowed site exhibits a remarkable state of preservation and has provided the basis for some important conclusions about the economic and social contexts of large biface production. Dillow's Ridge has also given us some detailed insights into Mississippian life in upland environments in the hill country of extreme southern Illinois. Some of the information from this intriguing site has been published (Cobb 2000; Thomas 1997), but what we seek to do here is provide a finer-grained description of the work at this site and some of its more important results.

Mill Creek chert most likely derives from residuum of the Ullin limestone formation found along a fault structure in southern Union and adjacent portions of Alexander counties, Illinois. For many years Mill Creek chert was attributed to the Salem limestone (May 1984; Spielbauer 1976) based on earlier geological maps, but the area was remapped by geologists in the early 1990s, and the boundaries of the Salem limestone and other formations were significantly redefined (Nelson et al. 1995). At the main quarry Mill Creek chert comes from a clay bed that sits on top of the locally exposed Fort Payne formation and is covered by unconsolidated deposits of the Cretaceous McNairy formation. Thus, the residuum should belong to the Ullin limestone, which lies above the Fort Payne in the local sequence, but until detailed geologic studies are done the attribution is not absolutely certain.

The source area is a series of small tributary valleys of Mill Creek, which itself is a south-flowing tributary of the Cache and Ohio rivers (Figure 1). Within the source area we currently know of two large quarries (Cobb 1988; Phillips 1899, 1900), a number of minor ones, and a substantial number of workshops. Although technically in the Ohio River drainage, the chert source is closer to the main valley of the Mississippi River, about 10 km to the west. There, the Linn site (11U28), a large Mississippian mound center, sits on the edge of the floodplain near the eastern margin of the valley (Cobb 1989; Merwin 1935; Milner 1993). Within or immediately adjacent to the source area are two small mound centers—Hale (11AX28) and Elco (11AX338). The Hale site, which is centrally located on a low ridge adjacent to the point where Cooper Creek enters the large expanse of the Mill Creek valley, was investigated by the Smithsonian at the same time as the quarries (Thomas 1894). It is the larger of the two with a platform mound and a substantial stone-box grave cemetery contained in a loaf-shaped mound. The Elco site (Cobb 2000) is a recent discovery and still something of a mystery. It is a single platform mound with an associated surface scatter that contains Mill Creek chert debitage and shell-tempered pottery, but it is situated 8 km southwest of Hale and not close to any known Mill Creek chert exposures.

The Dillow's Ridge Site

The Dillow's Ridge site is situated about 2.5 km west of the Hale site, on the edge of dissected uplands separating Cooper Creek from its tributary of You Be Hollow. The site occupies the triangular-shaped crest of a small, steeply sloped hill overlooking You Be Hollow (Figure 2). The hilltop and most of its slopes are covered with mature forest and are unplowed. The site is within an isolated tract of the Shawnee National Forest. The main Mill Creek quarry (Phillips 1900) is on the opposite side of the small valley about 500 m away. A stone-box grave cemetery is located on a ridge across the valley to the north, and that is thought to be the cemetery associated with this site.

The site was identified in 1987 by Charles Cobb in the course of survey work for his

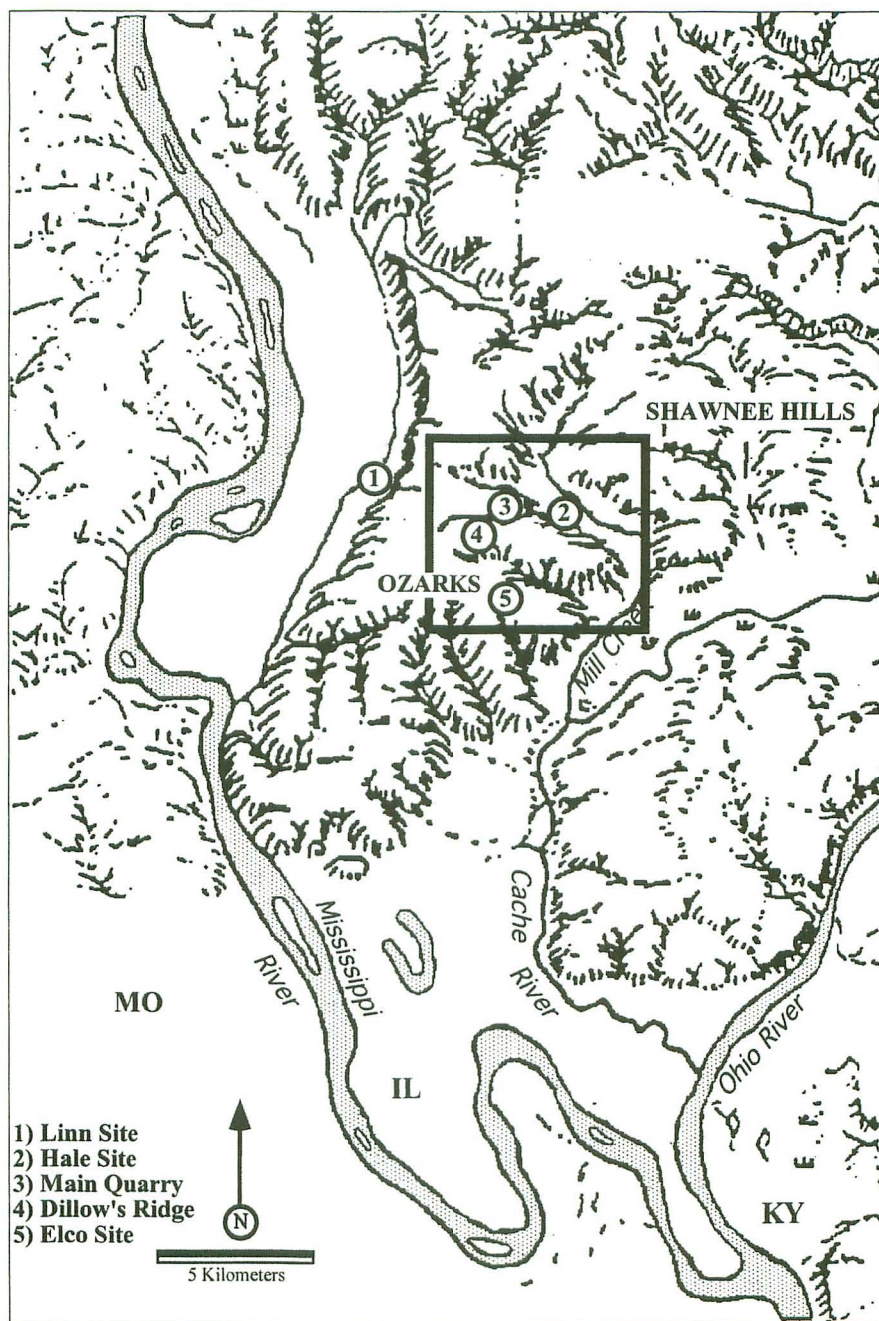


Figure 1. Key sites in the Mill Creek chert source locality. From Cobb (2000:99) by permission of the University of Alabama Press.

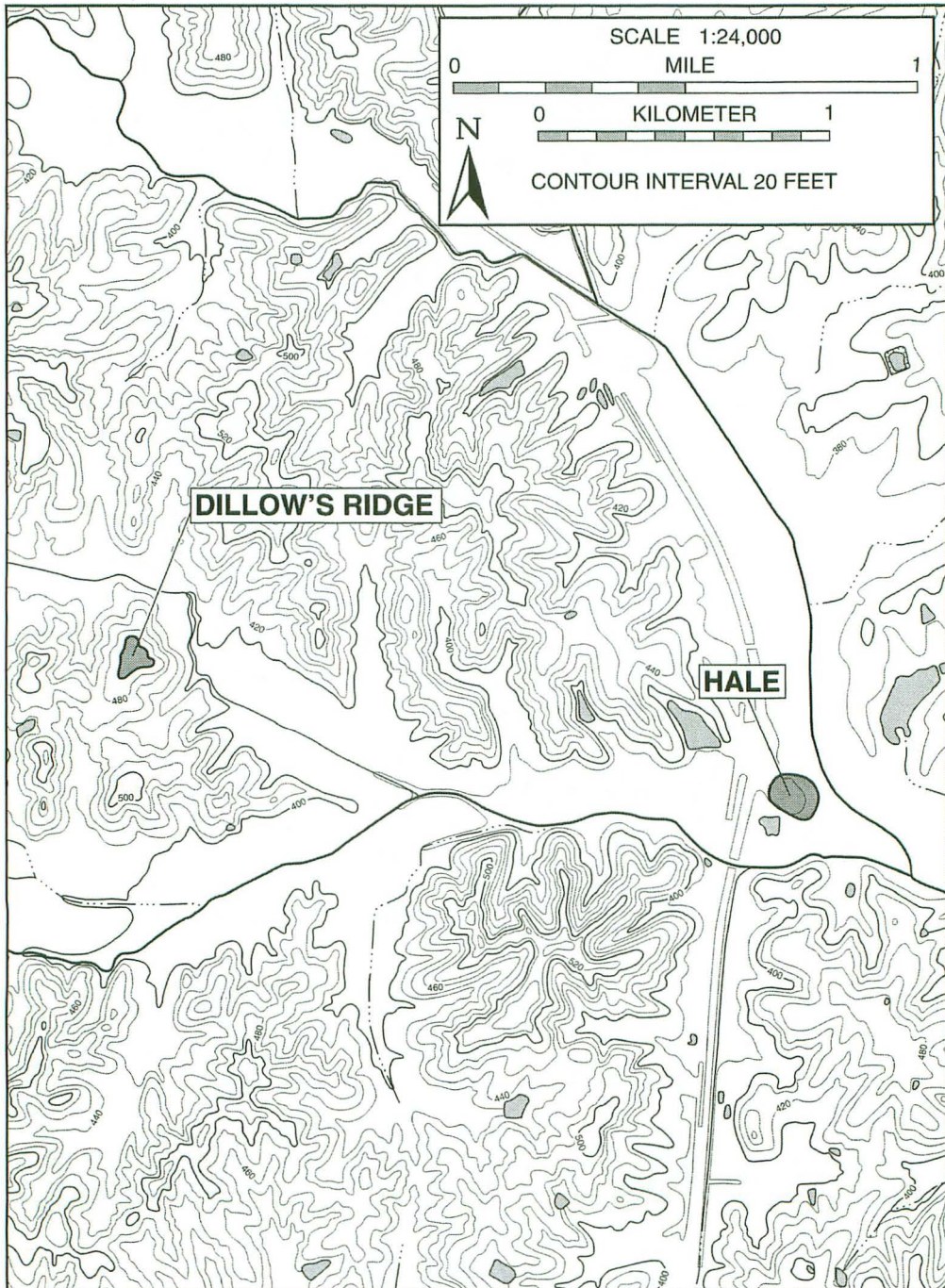


Figure 2. Topographic locations of the Dillow's Ridge and Hale sites.

doctoral research on the Mill Creek biface industry (Cobb 1988). With only surface observations, Cobb initially described the site as a quarry and workshop site, a reasonable conclusion given the proximity to the known large quarry and the presence of obvious depressions and much evident workshop debris. In 1992 Cobb returned to the site to conduct shovel testing, and in 1993 he directed a SUNY-Binghamton project there. Test excavations quickly revealed that the depressions were house basins and that the site, while clearly a major workshop, was also a residential site that contained domestic structures and the array of ceramics, tools, and subsistence remains that would be expected for any small village or hamlet. Given the obvious importance of this discovery, joint SIUC–SUNY-Binghamton field schools were organized in 1994 and 1995 to further explore the site. The 1994 session was directed by Charles (Chip) McGimsey and the 1995 season by Charles Cobb.

The core of Dillow's Ridge comprises approximately 5,000 m² (Figure 3). Arranged over the hilltop are 27 large surface depressions of varying sizes (indicated by dashed lines in the figure), all of which we now believe to be house basins, most of which represent multiple overlapping structures. These surface features and related debris are densely packed within a small area. The area of 5,000 m² refers only to the obvious core part of the site and, indeed, precise delimiting of the boundaries of this site is problematic. Workshop debris extends down the fingers on the north and east slopes of the hill toward the You Be Hollow valley. Some Mill Creek chert nodules can be found in the ravines about midway down the east slopes, and there are shallow excavations along this portion of the hillside. It appears that attempts were made to quarry some chert from just below the site, although it is doubtful that these efforts yielded large amounts of usable chert. One outlying house basin has also been identified on a lower lobe of the hill directly overlooking the channel of You Be Hollow Creek.

There is a distinct trash mound at the south end of the site, with ca. 1 m deep deposits containing densely packed lithic debris as well as large amounts of domestic refuse (see Cobb 2000:165, Figure 7.4). In addition, there is a series of middens or dumps around the margins of the site ranging from 40 to 80 cm in depth. These deposits contain bulk chipping debris as well as standard domestic refuse including pottery, daub, stone tool fragments, and (in some cases) well-preserved floral and faunal remains. Unfortunately, the professional archaeological work seems to have called attention to the site among local relic collectors. The only significant incident of vandalism was between the 1993 and 1994 seasons. A group of collectors, knowing full well that the site was Forest Service property, dug a large hole into the east side of the trash mound and screened the fill.

Fieldwork

The three seasons of work (Cobb 1995; Cobb and Thomas 1994; McGimsey 1994) involved the excavation of 81 numbered test units (TU)—twenty-five 0.5 x 0.5 m, and fifty-six 1 x 1 m—totaling 61.25 m² in area (Figure 3). Six of the 1 x 1-m units were individual excavations, but the remainder were grouped into 10 larger units—nine trenches and one excavation block. The investigations were, in effect, an extensive testing program. The site's pristine state and its presence on Forest Service land meant that it was protected from the usual threats of development, and large-scale disturbance of the deposits was not justifiable. Large-scale work was also considered unrealistic because of the staggering amounts of Mill

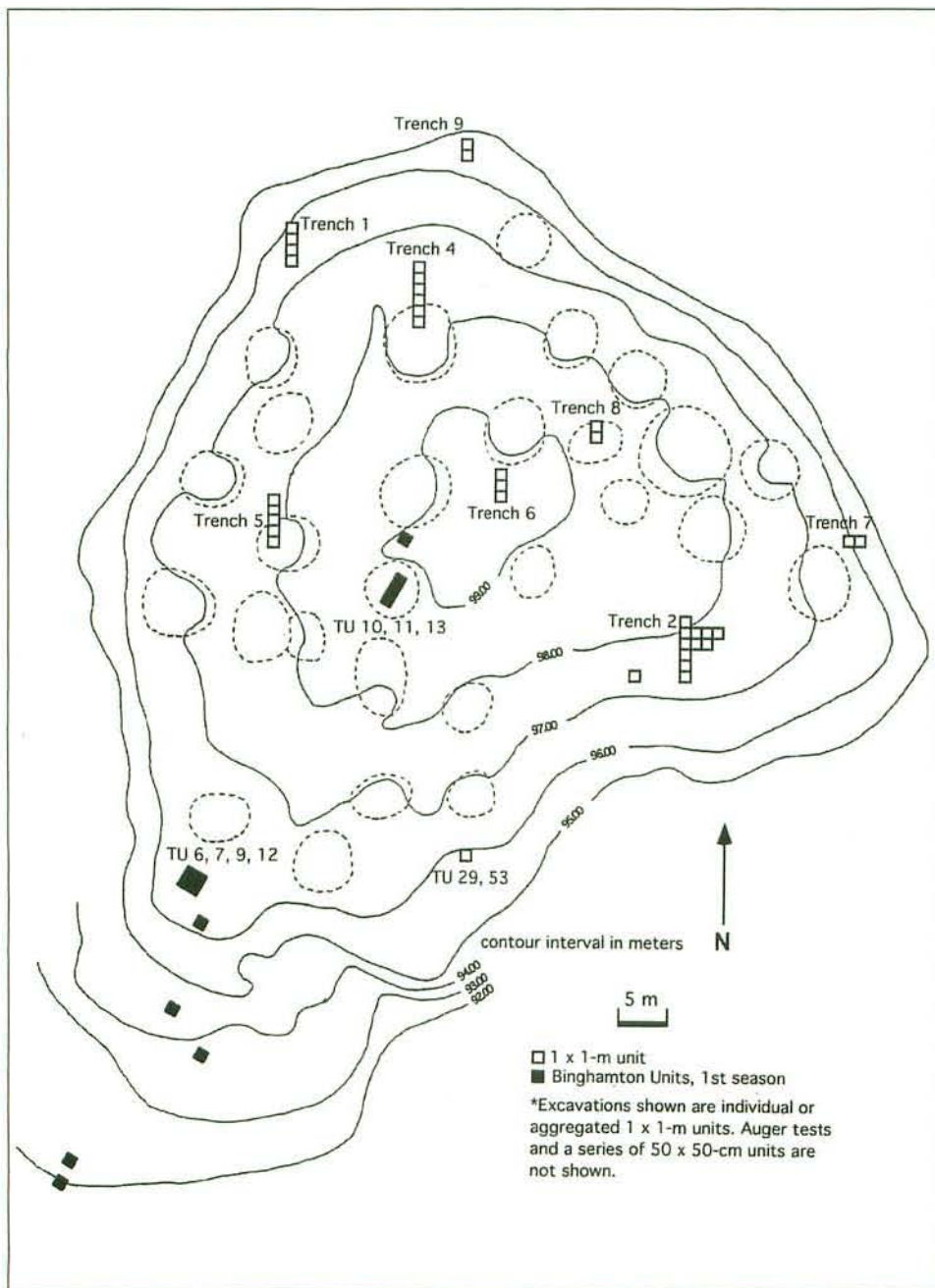


Figure 3. Dillow's Ridge site map with excavations. Adapted from Cobb (2000:163) by permission of the University of Alabama Press.

Creek chert lithic debris that the site contains. Although the scale of the individual excavations was small, an effort was made to sample widely across the site, including non-basin as well as basin contexts.

In 1994, a 5-m grid bucket-auger survey of the hilltop was done. This provided a spatially comprehensive, volumetrically controlled sample of site deposits and proved to be especially informative, identifying numerous buried basin features and floors. The auger grid excluded the trash mound at the south end of the site, as it had been tested in the 1993 season, but otherwise included the entire hilltop to the sharp slope break. As a rule, auger tests were not placed within the visible basins to avoid damaging the house floor deposits. A total of 141 3-inch (7.62 cm) diameter bucket-auger samples were taken. Of that total, 52 auger tests (36.9 percent) produced evidence of subsurface features or floors. When an auger test was "positive" for subsurface features, additional coring with a small-diameter Oakfield corer was done at 1 m intervals around the auger test. At the end of the project, only the northern half of the site had been explored with the additional small-diameter coring (a total of 181 probes). Ninety-five (52.5 percent) of these probes encountered subsurface fill. It is impossible in most instances to determine whether the encountered fill represented a pit feature or a structure basin, but inspection of the distribution of positive cores across the tested areas strongly indicates that most subsurface features are house basins.

The twenty-five 0.5 x 0.5-m units were designed to augment the results of the bucket-auger survey. Each unit was placed at a 5-m grid point where the soil probe and auger data suggested subsurface features were not present. The idea was to avoid encountering complex stratigraphy within a small unit where it could not be easily understood. Initially, unit locations were arbitrarily chosen based upon the results of the auger testing; selected units were placed to confirm areas of extremely low artifact density or areas of particularly interesting artifact occurrences. After the first seven units were excavated, subsequent unit locations were placed systematically across the site, particularly in the western half of the site.

In November 1994, R. Berle Clay carried out an electrical conductivity survey on the gridded site area, covering 11 complete 20-m blocks and three partial ones. This survey produced some useful results, but given the extent of cultural disturbance and the buried and overlapping house basins across the site, the data are often difficult to interpret.

The major excavation units are described below. Note that there was no Trench 3. Radiocarbon dates are reported as calibrated with one standard deviation; calibration was supplied by Beta Analytic of Miami, Florida.

TU 6, 7, 9, 12 (1993)

These four contiguous units comprised a 2 x 2-m unit that was excavated in the center of the trash mound at the south end of the core site area. This mound proved to have an approximately 1 m thick accumulation of both domestic and lithic production debris, which yielded the largest samples of domestic refuse and subsistence remains from the site (see Cobb 2000:165). Portions of what are thought to be three different house floors were also identified within the mound. Refuse disposal at this location took place before, during, and after this locus was used as a house site. A radiocarbon date of A.D. 1270 (1290) 1300 was obtained from the fill of the youngest house floor in this sequence.

TU 10, 11, and 12 (1993)

This 1 x 3-m trench was placed in a shallow basin near the center of the site after a small test unit adjacent to the basin encountered burned house fall. The trench found a shallow layer of humus formed over a house floor with burned house remains. A hearth was also located. Charcoal samples from the burned structural remains yielded calendar dates of A.D. 1300 (1410) 1430 and A.D. 1290 (1310, 1360, 1390) 1410. Based on what we have subsequently learned, we now believe that this burned house is only the most recent one represented within this basin.

TU 29, 53 (1994)

This unit combination was not one of the major excavation units but is noted because of its unexpected results. TU 29 was one of the original 0.5 x 0.5-m units placed on the southern rim of the site. The unit encountered a rich sheet midden that was especially notable for well-preserved faunal remains. TU 53, a 1 x 1-m unit, was excavated immediately adjacent to increase the faunal sample and obtain flotation samples. This unit also yielded the only more-or-less complete pottery vessel from the site—the body of a small polished carafe-style water bottle. The neck was snapped off but the break was ground smooth, suggesting that the vessel continued to be used.

Trench 1 (1994)

This 1 x 4-m trench (Figure 4) was excavated on the northwest margin of the hilltop to locate a suspected palisade. It was placed at the break in the slope at the hilltop edge and did eventually succeed in identifying (in the north end) a short section of aligned postholes we believe do represent a single-phase palisade or stockade line. This line of posts rests too far down the slope to represent the wall of a structure. The southern end of the trench, however, encountered the corner of a wall-trench structure set in a shallow basin. There were no surface indications of a basin here, but an auger test near here did suggest that one was present in this vicinity. This structure had two different floor surfaces within it, and the basin was subsequently filled and leveled with clean fill. The temporal relationship between the suspected palisade and the house basin are not clear, but the house and the palisade may be contemporary. One of the complete Ramey knives (Figure 5c) was recovered from within this house basin.

Trench 2 (1994 and 1995)

This began in 1994 as a 1 x 4-m trench placed in the southeastern quadrant of the site (Figure 6). Trench 2 was designed to investigate a buried basin indicated by an auger test. This buried basin is the only one in this part of the site and is relatively isolated from the other known basins. It was this isolation that led to the selection of this location for excavation. The trench encountered a burned wall-trench structure (wall trenches 1A-C) set in a backfilled basin. In 1995 the trench was expanded eastward with six additional units to increase the exposure of the house. There are two hearths associated with the floor of the wall-trench structure. Samples from the burned house fall and from a wall trench of this structure yielded dates of 1260 (1280) 1300 and 1300 (1310, 1360) 1400 A.D. The 1995 work showed that a single-post structure was later built in the abandoned basin of the

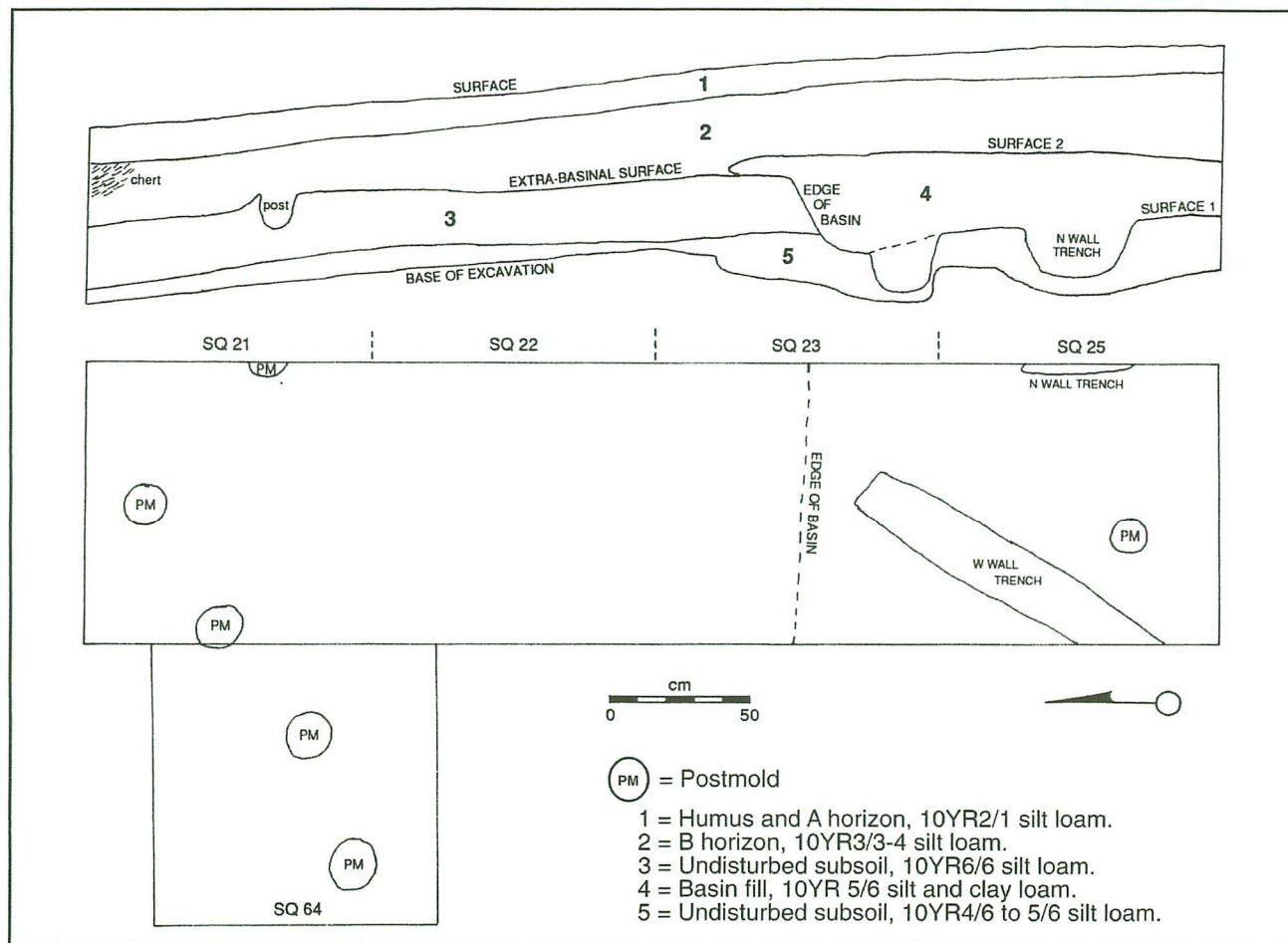


Figure 4. Plan and east profile views of Trench 1.

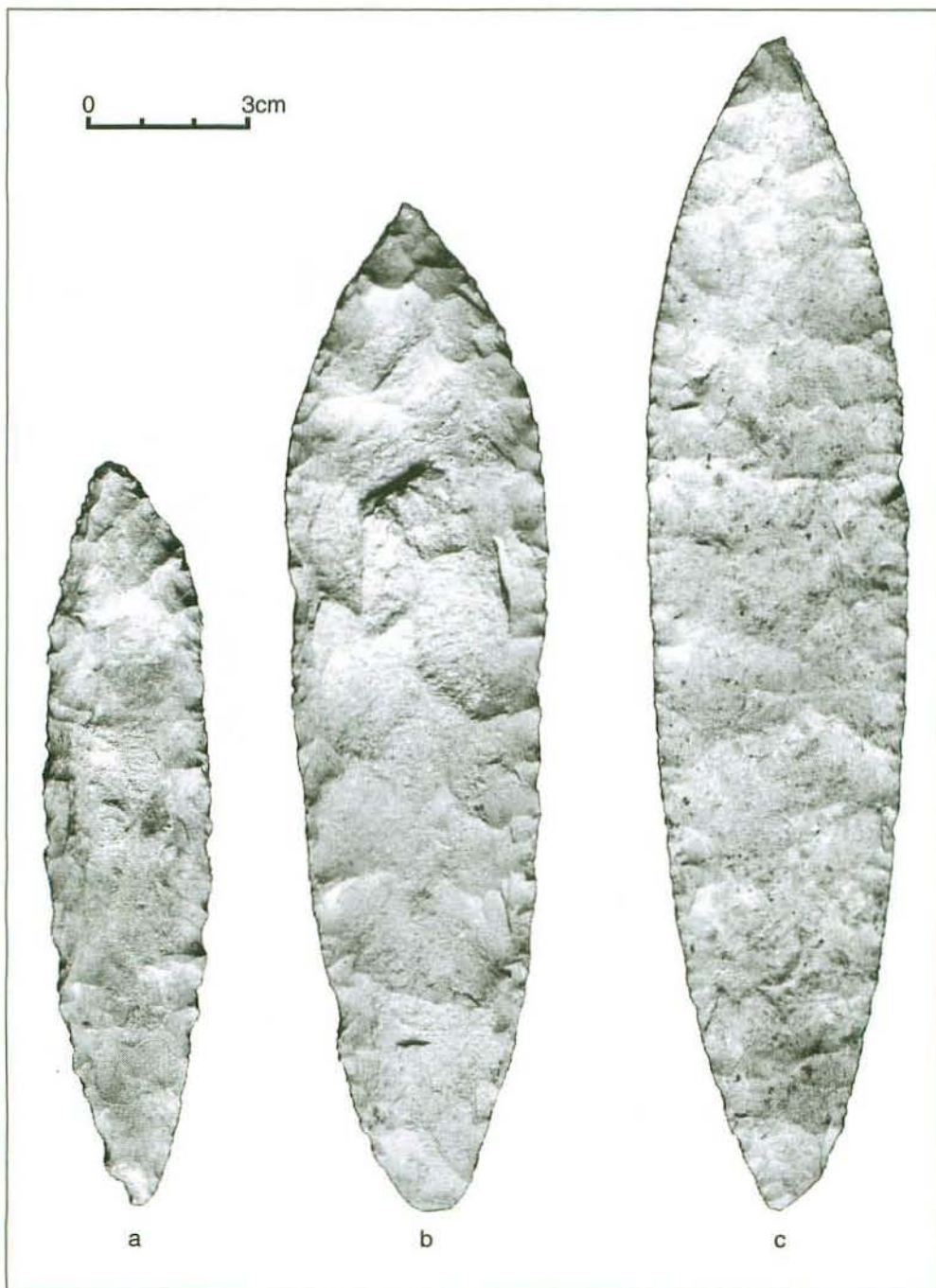


Figure 5. Ramey knives from Dillow's Ridge.

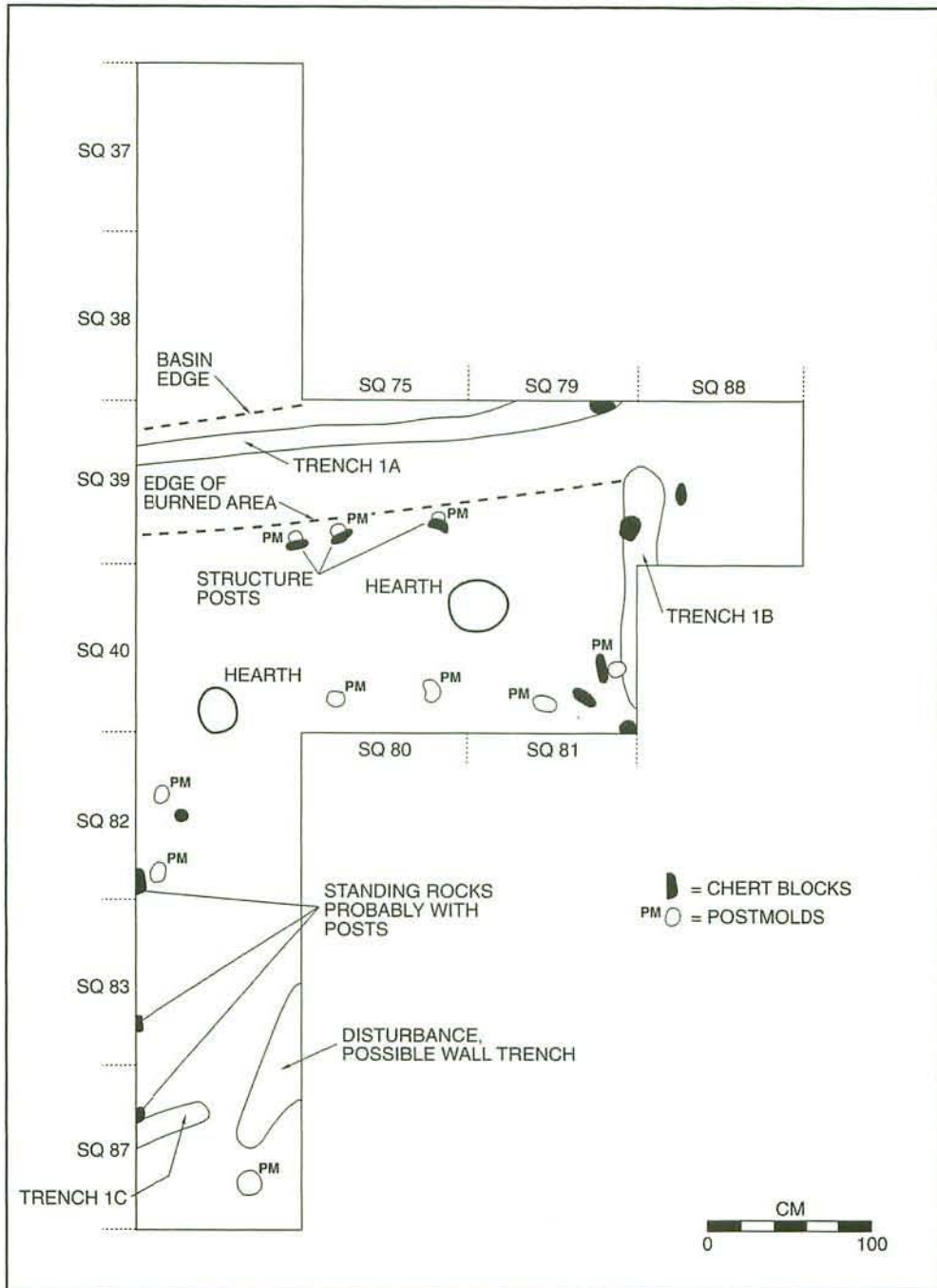


Figure 6. Plan view of Trench 2 and expanded areas. Adapted from Cobb (2000:164) by permission of the University of Alabama Press.

wall-trench structure. There is a series of postholes with chunks of chert placed in them, and the floor level seems to be marked by a number of large rocks (and part of a grinding stone) resting on top of the burned debris of the wall-trench house. A battered and burned Ramey knife (Figure 5a) was also recovered from this surface. This structure is assumed to be a very late one, as in the case of Trench 5, although the structure is presently undated.

Trench 4 (1994)

This 1 x 5-m trench (Figure 7) crosscuts one of the deeper basins on the site and revealed a complex sequence of three overlapping wall-trench structure plans with the oldest being the central one and the younger ones positioned to the north and south. In the field the northern-most structure (Basin 4A, surface 5, zone 6, and wall trench 1) was interpreted to be the earliest, but two late radiocarbon dates from its remains (intercepts of A.D. 1420 and 1490) show that the initial stratigraphic interpretation was incorrect. The earliest structure is apparently the middle one, represented by Basin 4B (surfaces 3 and 4, zones 4 and 5, and wall trench 2) dated at A.D. 1250 (1290) 1390. The southern structure is represented by Basin 4C (surfaces 1 and 2, zones 7 and 8, with wall trench 3). The middle and southern structures each have two different floors separated by a thin layer of fill. The upper layer of fill for the middle structure contained a chert dump, a layer of pure debitage discarded in the abandoned basin.

Trench 5 (1994)

This 1 x 6-m excavation crosscuts a shallow depression, which the coring program had identified as containing only a shallow layer of humus instead of the typical thick fill. It was expected that this basin would represent one of the later structures on the site. That inference proved to be correct, although the area was far more complex than anticipated (Figure 8). The trench encountered portions of two earlier wall-trench structures, although the final building episode, the one represented by the shallow basin, proved to be a burned house of single-post construction with chunks of chert placed in the postholes. Charcoal from the house fall yielded a date of A.D. 1420 (1440) 1490. The north end of the trench encountered the edge of a large pit feature (Feature 7). The pit, which dates between the two wall-trench building episodes, exhibited intensive firing and contained large amounts of burned chert. We believe this pit is an earth oven that used chert instead of sandstone or limestone for the rock charge. One of the complete Ramey knives (Figure 5b) was under the floor of the second wall-trench structure.

Trench 6 (1995)

This 1 x 3-m unit was excavated at one of the highest points of the site to check out a very high conductivity reading from the EM survey. Nothing specific was found that would explain the high reading, and no features were found, but the unit did encounter one of the few instances on the site of a relatively undisturbed, natural soil profile. Even here, however, there is an upper layer of 20 to 25 cm that may, in fact, be spoil spread around from nearby basin excavations.

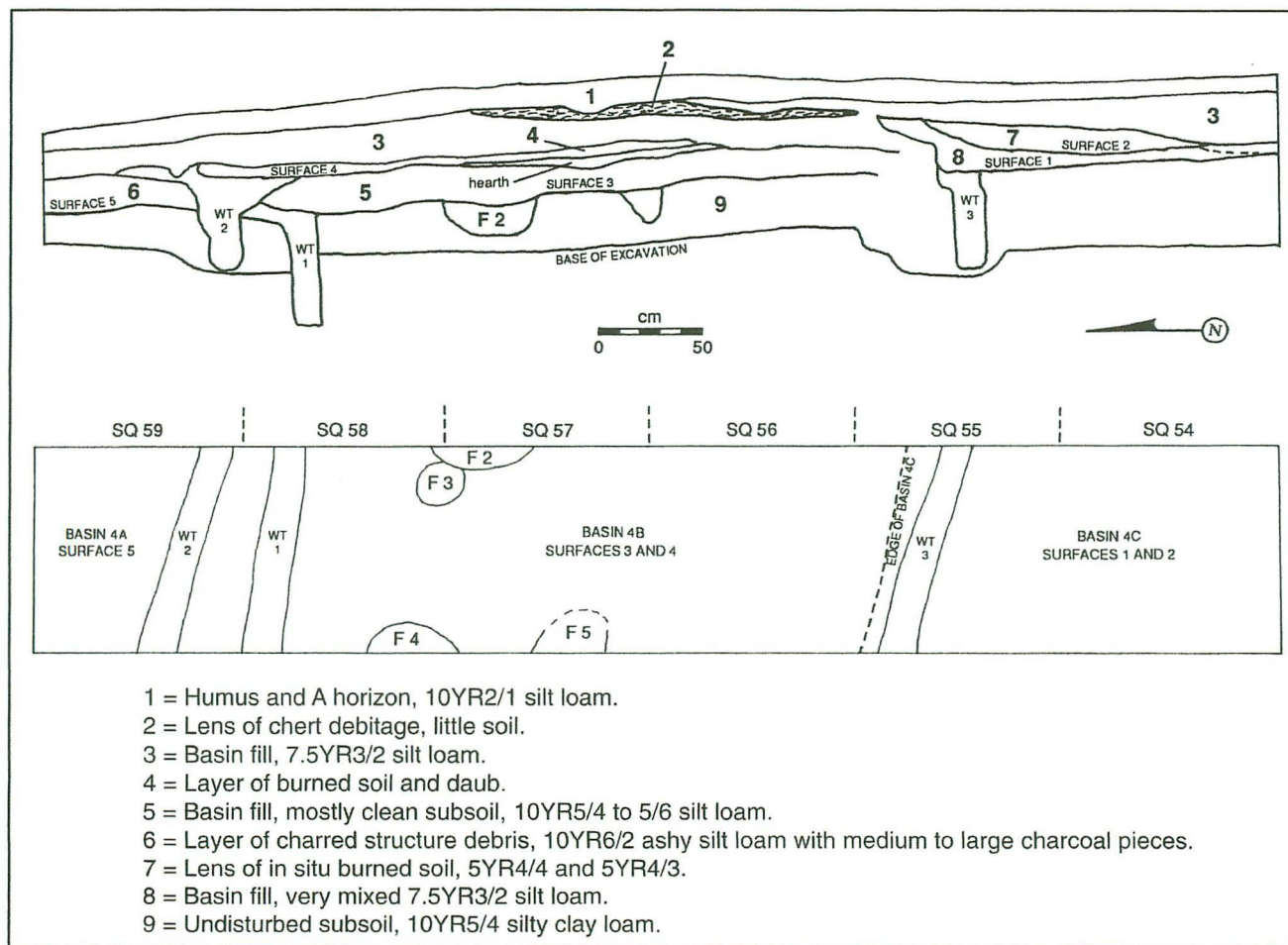


Figure 7. Plan and east profile views of Trench 4.

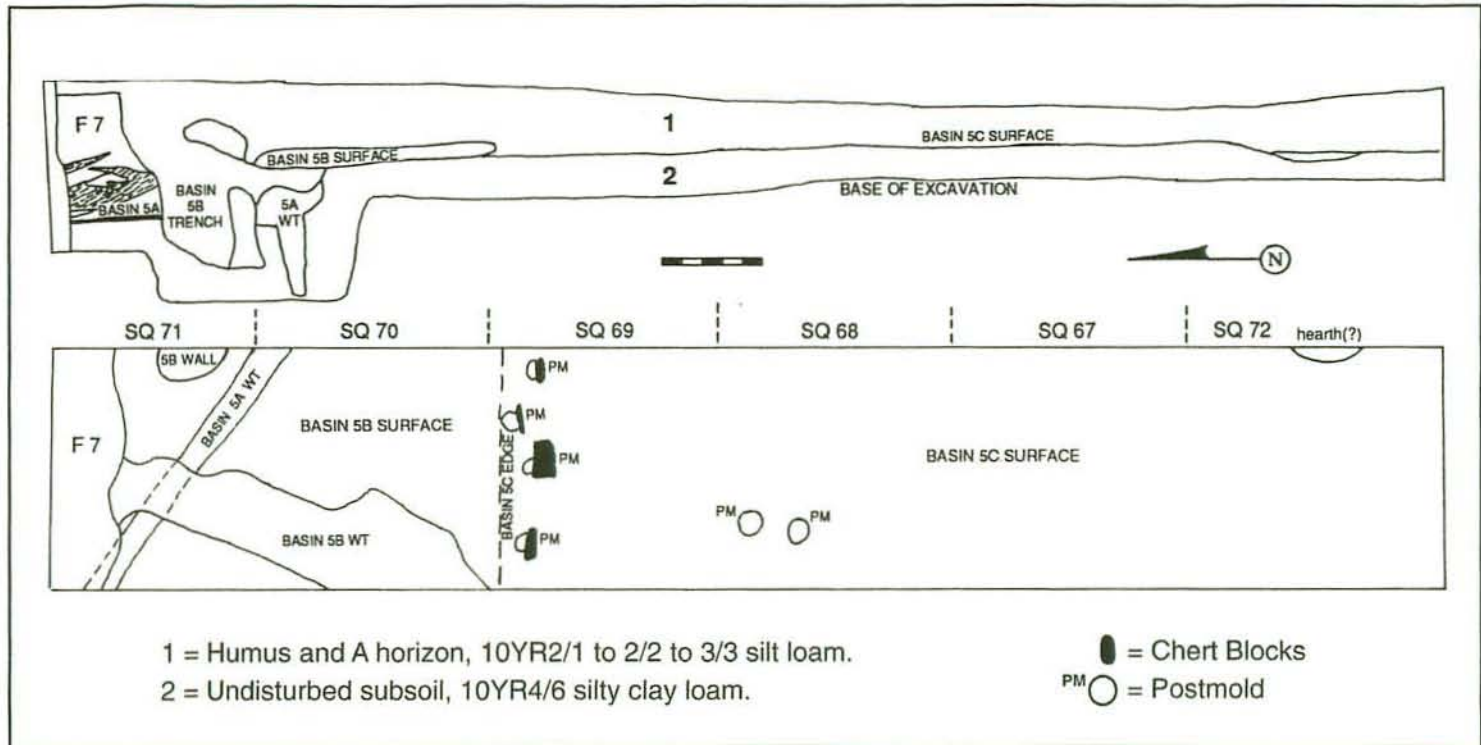


Figure 8. Plan and east profile views of Trench 5.

Trench 7 (1995)

This 1 x 2-m unit was an attempt to find the palisade line on the eastern rim of the site at a point where a house basin next to the rim restricted the area where such a feature could be placed. No evidence of the palisade was encountered, but the deposits proved to have such a complicated sequence that it is possible palisade remains may have been obscured here. The area exhibits a 60 cm thick complex of deposits that were built out over the original rim of the hilltop. Portions of one or two structure basins were identified, depending on how one interprets the stratigraphic relationships. Three building episodes are represented, and the most recent structure was burned. The trench also encountered a chert dump on the slope and the edge of a possible erosional feature.

Trench 8 (1995)

This 1 x 2-m unit was excavated within a small basin on the eastern side of the site. The location was selected because of very high readings recorded in the conductivity survey, and a careful examination of the surface found no metal items to explain the reading. The basin in question is not as well defined as the others, suggesting some later truncation or modification. The excavation produced no definitive results. The sediments encountered were not like the typical basin fill at this site, and were marked by a low artifact density. The small unit missed the structure walls but did encounter three substantial postholes that, collectively, may explain the high conductivity readings.

Trench 9 (1995)

This 1 by 2-m unit was placed on the rim of the north edge of the site to sample a midden deposit identified by augering. The excavation encountered a ca. 40 cm thick deposit of refuse that contained various substrata indicative of dumping. Artifact densities were some of the highest found on the site, but the bone was highly fragmented and not present in the same density as in midden deposits sampled in the southern portions of the site. This midden area probably lies outside the palisade line.

Chronology

There are 12 radiocarbon dates from the site, and these portray a very consistent picture (Table 1). The calendar-corrected intercepts of all 12 dates fall between A.D. 1220 and 1490. The earliest intercept (A.D. 1220, Beta 66224) appears to be a slight outlier, with the true age more likely falling in the younger portion of the two sigma range (A.D. 1030 to 1290). This is supported by the fact that the same structure produced another date with multiple intercepts in the 1300s and a two sigma range of A.D. 1270 to 1420 (Beta 70848). Three other dates have one sigma ranges that tightly bracket the late 1200s and this cluster is believed to represent the initial occupation. Our evaluation of these dates suggests an occupation span of approximately 200 years from the late 1200s A.D. to between 1450 and 1500. The site clearly belongs to the second half of the Mississippian sequence, and the date range indicated here is fully consistent with the ceramics recovered from the site (Thomas 1994, 1997).

Table 1. Dillow's Ridge Radiocarbon Dates.

Sample	Provenience	Material	C13/C12	¹⁴ C Age (BP)	Calib Age 1SD	Calib Age 2SD	Intercepts
Beta 66224	Structure 8	charred wood	-25.0	830 ± 70	1160 to 1270	1030 to 1290	1220
Beta 66226	Structure 22	charred wood	-25.0	560 ± 80	1300 to 1430	1280 to 1460	1410
Beta 66227	Structure 22	charred wood	-25.0	620 ± 70	1290 to 1410	1270 to 1430	1310 1360 1390
Beta 70848	Structure 8	charred wood	-25.0	630 ± 60	1290 to 1400	1270 to 1420	1310 1370 1380
Beta 70849	Feature 16	charred wood	-25.0	700 ± 50	1270 to 1300	1250 to 1320 1340 to 1390	1290
Beta 74677	Unit 55-04	charred wood	-26.9	710 ± 90	1250 to 1310 1360 to 1390	1170 to 1420	1290
Beta 76478	Unit 40-05	charred wood, grass	-28.0	720 ± 60	1260 to 1300	1210 to 1320 1340 to 1390	1280
Beta 76479	Unit 72-03	charred wood	-27.4	440 ± 70	1420 to 1490	1400 to 1640	1440
Beta 76480	Unit 59-04a	charred wood	-24.3	370 ± 60	1450 to 1530 1550 to 1630	1430 to 1650	1490
Beta 90371	Unit 59-06	charred wood	-27.5	510 ± 110	1310 to 1360 1390 to 1460	1280 to 1640	1420
Beta 90372	Unit 77-02	charred wood	-26.6	590 ± 60	1300 to 1420	1290 to 1430	1400
Beta 90373	Unit 79 PM 21 Wall Trench 1a	charred wood	-25.8	620 ± 50	1300 to 1400	1280 to 1420	1310 1360

Structures

The auger survey made it clear that most of the hilltop, at one time or another, was culturally modified. There are numerous additional buried house basins and floors that have been covered over or backfilled and do not show on the surface. In most cases the depressions are the result of two or more superimposed structure basins where the orientation or horizontal placement shifted slightly. We currently have evidence for around 40 basins, both visible and buried, and these may represent as many as 75 separate house plans, some of which have two associated floor levels. Larger test units were excavated in four of the visible house basins, but excavations in three other locations where there were no surface depressions also encountered houses.

Nearly all houses appear to be wall-trench structures with likely dimensions in the range of 5 by 5 m or greater. We have identified two structures of single-post construction, and both appear to be the last buildings in their respective locations. To date, nearly all the structures investigated appear to be burned. Generally, the basins were well-cleaned prior to the next construction, and in some cases a layer of clean subsoil was laid over the old floor. In three cases, large intact areas of burned structural debris were encountered. After abandonment, some of the depressions were backfilled with spoil from the construction of nearby basins. Abandoned basins were sometimes used as dumping areas for chipping debris.

There is no evident pattern to the distribution of the visible or subsurface house remains. Specifically, there is no evidence for an open area or plaza at the center of the site, but the lack of dating for most structures renders any pattern recognition difficult. The site supported a small resident population who continually shifted house locations and rebuilt across the entire hilltop that we have defined as the core of the site. Taking into account the estimated number of basins and the rebuildings associated with each, there may be over 150 separate building episodes represented at the site. Given the confines of the hilltop and the known placement of structures, the likely number of structures that stood at any one time is estimated at no more than 10. Obviously, more than 10 structures can be fit on the hilltop, but with more than that the site area becomes extremely cramped with little room for extra-mural activities. If it were not for the massive quantities of chert debris that mark this site as a major workshop, Dillow's Ridge would be viewed as a typical small Mississippian settlement, albeit in an unusual location and unusually well preserved.

Artifacts and Subsistence Remains

Lithic Tool Production

The site contains prodigious quantities of chert debris from the production of Mill Creek chert artifacts. Density of the lithic debris can vary widely, with the extreme cases being layers of almost pure chert flakes and no soil. Individual 10-cm levels from 1 x 1-m units in the trash mound, which is mostly lithic debris, produced between 3,500 and 7,000 flakes (Cobb 2000:165)—a density range from 35,000 to 70,000 pieces per m³. Elsewhere the chert concentrations are less dense but still impressive. The debitage from general midden excavation from nine 1 x 1-m units from all over the site (1994–1995) totaled 50,252 pieces from a volume of roughly 2.4 m³, a mean density of 20,938 pieces or 35.3 kg per m³ (Morris 1995,

1996). There has been no comprehensive analysis of the debitage, but two analyses of selected samples of the debris (totaling over 165,000 pieces of all sizes) using the mass analysis techniques described by Ahler (1989) show that, as might be expected, a soft-hammer biface reduction sequence is responsible for much of the debris (Cobb and Thomas 1994; Morris 1995). Large bifacial thinning flakes with heavily ground striking platforms are especially notable. It is possible that minimally tested or trimmed slabs were sometimes brought to the site, but raw nodules apparently were worked there as well. The entire production sequence is attested by the presence of primary forms, rejects, and production failures from all stages. Large cortical flakes are also common.

From the rejects and production failures it is evident that two different tool forms are the principal products: large biface digging implements (hoes) and more finely made biface knives of the bi-pointed form, sometimes called Ramey knives in the Midwest. Adzes and chisels were also made but in very small numbers, and these do not appear to have been important products. Ramey knife fragments outnumber hoe fragments, but this may be an artifact of different failure rates and recycling habits. Nevertheless, the common recovery of Ramey knives in various stages suggests that they may have been an equally important export as hoes. Finished hoes and Ramey knives (showing evidence of use) do occur on the site but in small numbers, and it is obvious that the bulk of the site's lithic production went elsewhere.

Aside from large biface fragments and the manufacturing failures, the Dillow's Ridge lithic tool assemblage is that of a "typical" Mississippian village, with one notable exception. On most Mississippian sites in the region outside of the Mill Creek locality, large pieces of chert are a rarity and Mill Creek chert items, which are usually the largest pieces of raw material on the site, are intensively recycled. In contrast, there was relatively little lithic rejuvenation going on at Dillow's Ridge, and the result is that we have a much better representation of some tool forms, whose presence on other sites is often obscured by recycling activity. A wide variety of formal and informal lithic tool types have been recovered. These include triangular projectile points, adzes, picks, large formal flake scrapers, and numerous retouched flake tools and utilized flakes. The frequent breakage and evidence of use-wear on these tools indicates they were locally used, and not made just for export. Table 2 is a summary table of the chipped-stone tools recovered from the excavations. Several aspects of the assemblage deserve further comment.

The number of triangular points ($n = 94$) is large, and most of the "other" projectile point category ($n = 29$) are likewise fragments of triangular points. The projectile points are almost all of the simple triangular form; there are a few notched examples and one Nodena-like point. About 83 percent of the triangular projectile points are of Mill Creek chert, and most of those specimens are heat treated. Small projectile points are the only tool form at Dillow's Ridge for which heat treating was consistently used.

The Ramey knife category includes three complete examples (Figure 5). One was found on a house floor and two were found beneath house floors. The two subfloor specimens (Trenches 1 and 5, Figure 5b, c) might represent offerings of some kind. Indeed, those two pieces are in mint condition, whereas the third, associated with a late single-post structure (Trench 2), is heavily used and fire damaged (Figure 5a).

Hoes were not only manufactured at the site, but also used by the inhabitants. The hoe category includes one complete example (see Cobb 2000:16, Figure 1.3) and several fragments showing use-polish. Polished hoe sharpening flakes are also present among the

Table 2. Summary of Chipped Stone Tools from Dillows's Ridge.

	1993	1994	1995	Total
BIFACE TOOLS AND CORES				
Blank	1	12	6	19
Hoe preform	6	4	3	13
Knife preform	3	3	7	13
Adze/chisel preform	2	0	0	2
Other preform	2	3	2	7
Hoe	3	12	5	20
Ramey knife	15	8	6	29
Other biface	10	6	6	22
Triangular projectile point	40	22	32	94
Other projectile point	4	10	19	33
Pick	0	0	0	0
Adze/chisel	2	2	2	6
Celt	1	0	0	1
Drill	8	3	3	14
Core	0	7	13	20
Tested nodules	0	18	5	23
Subtotal	97	110	109	316
FLAKE TOOLS				
Utilized flakes	210	824	80	1,114
Retouched flakes	*	82	18	100
Retouched flakes-serrated	7	64	21	92
Scraper	10	12	13	35
Knife	0	1	6	7
Notch/spokeshave	36	0	2	38
Reamer	2	2	3	7
Microdrill	0	0	1	1
Miscellaneous retouched	1	2	0	3
Subtotal	266	987	144	1,397
Total	363	1,097	253	1,713

*Category not used in 1993 analysis, included in utilized flakes.

copious amounts of production debris. The analyzed sample of 1993 debitage noted above yielded 27 hoe flakes.

The tool assemblage is unusual in containing a large number of complete, large formal uniface scrapers (DelCastello 1997) (Figures 9 and 10a, c). These are usually made from large bifacial thinning flakes. Such scrapers are rarely found intact on Mississippian sites in the region, where most flake tools are made from small cores or are recycled fragments of large bifaces. The sheer abundance of large flakes at Dillow's Ridge made the production of these large scraper forms possible. Apparently some of these large scrapers were trade items along with the bifaces. Mississippian lithic assemblages from sites in the region sometimes contain recognizable (recycled) fragments of these tools, and a number of similar ones have been recovered from the Wickliffe site in western Kentucky (Koldehoff and Carr 2001).

Another notable constituent of the chipped-stone tool assemblage are over 90 large flake tools that exhibit working edges with multiple notches. In the table these are described as "serrated" although this is somewhat misleading; the notches are usually fairly broad and the result is more of a crenellated edge (Figure 10b). Occasional fragments of these are found in regional Mississippian assemblages (such as Millstone Bluff and Hayes Creek), but they are rare, again, because of limited export and recycling.

In terms of raw-material usage, virtually all of the chert found at the site is Mill Creek chert. The amount of other cherts is amazingly small. Especially notable by its near-absence is Kaolin chert, which often figures prominently in local tool assemblages (chisels, adzes, knives, and scrapers) outside of the Mill Creek source locality. In terms of debitage, there is a handful (literally) of non-Mill Creek chert items. A size-graded sample of 1993 chert debitage totaling just over 115,000 pieces yielded a total of 46 non-Mill Creek pieces: 24 Cobden/St. Louis, 11 Kaolin, 4 Bailey, and 7 other (Cobb and Thomas 1994; see Koldehoff 1985; May 1984 for local chert type descriptions). In terms of tools, non-Mill Creek chert items are largely restricted to small projectile points that could be produced from small flakes. Sixteen (17 percent) of the 94 total triangular points are of non-Mill Creek chert: six of Cobden/St. Louis, four of Kaolin, four of Bailey, one of Mounds gravel, and one unknown. Five of 33 (15 percent) other projectile points (fragments) likewise are of non-Mill Creek cherts. There are only 15 non-Mill Creek chert specimens (5 percent) among the 283 re-touched flake tools (all flake tools excluding utilized flakes). These consisted of five Cobden/St. Louis, four Kaolin, four Bailey, one Mounds, and one Kornthal. From the extreme scarcity of debitage, it is clear that non-Mill Creek chert is arriving in small pieces: flakes, small cores, and, in some instances, finished tools.

Finally, there is almost no conventional fire-cracked rock (sandstone, limestone, or till cobbles) on the site. The raw material for such is largely lacking near the site, the only bedrock exposure being one small outcrop of cherty Ft. Payne limestone in the bank of You Be Hollow Creek. It was noticed, however, that small quartz pebbles were ubiquitous throughout the deposits. Later we realized that these derived from a coarse, poorly cemented conglomerate that derives from Cretaceous deposits (McNairy formation) that overlie the bed of residuum containing the chert nodules (Nelson et al. 1995). Chunks of this conglomerate can be found in ravines of the site and other nearby hills as well as occasionally in the stream beds. This material was apparently collected and used for cooking/heating rock, but it quickly disintegrates under heating and only the quartz pebbles re-

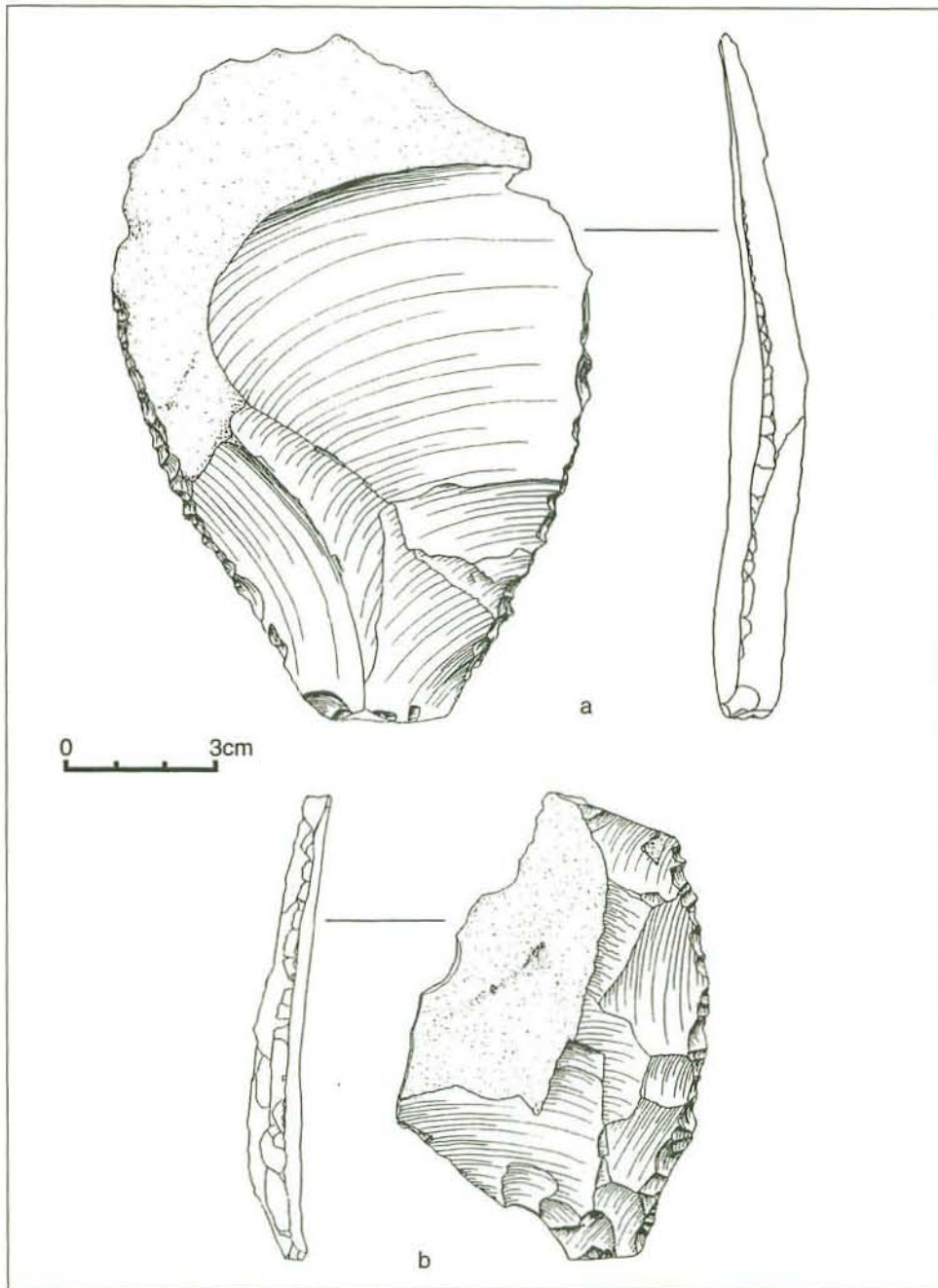


Figure 9. Large scrapers from Dillow's Ridge.

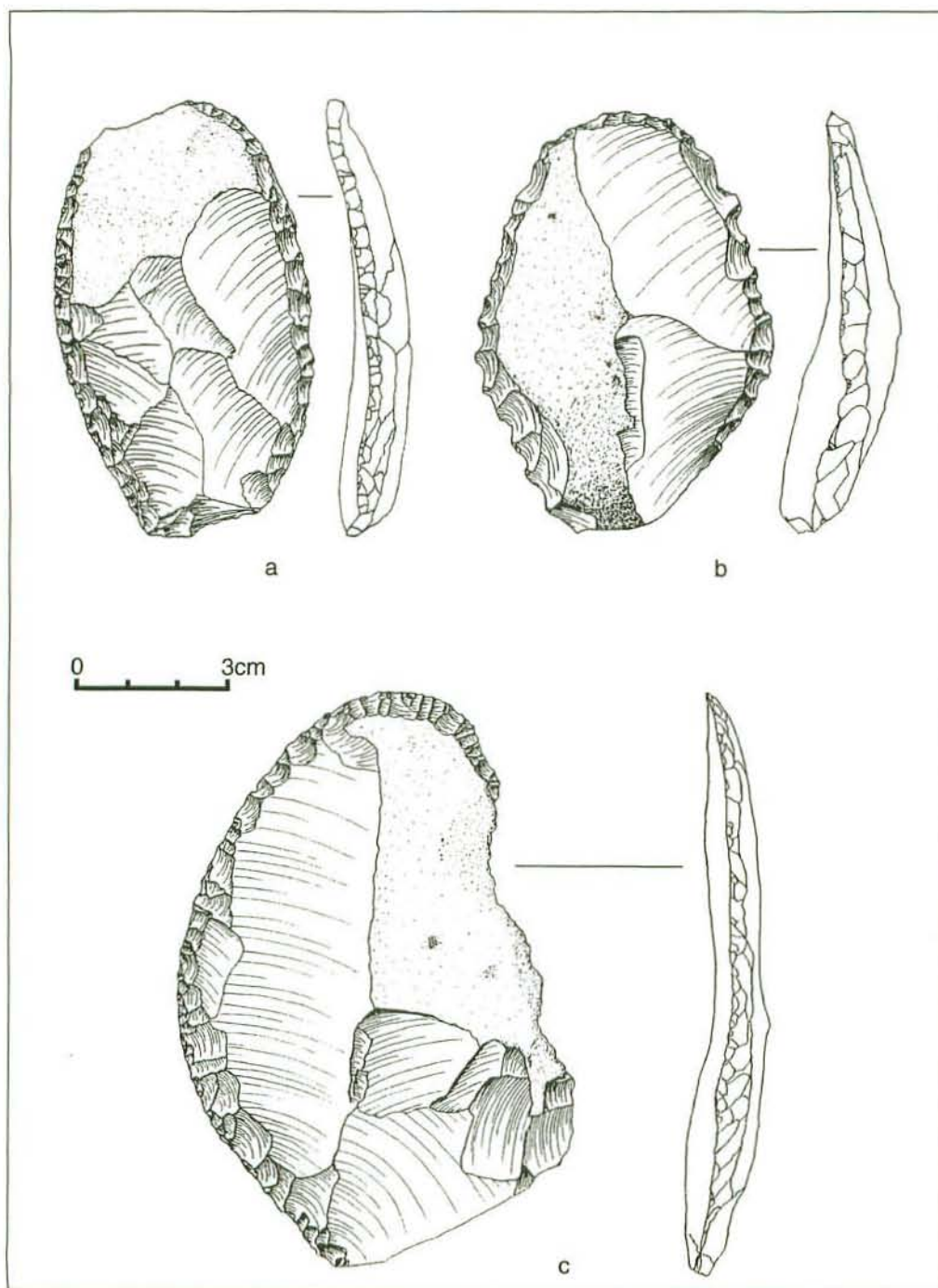


Figure 10. Large scrapers (a, c) and serrated tool (b) from Dillow's Ridge.

main. In other circumstances it appears that the occupants also used chert debris as cooking rock.

Ceramics

Over 20,000 sherds have been recovered from the site. Included in that total is one complete vessel, the neckless bottle found in a midden deposit. The ceramics from the 1992–1994 work have been described by Larissa Thomas (1997; Cobb and Thomas 1994). The 1995 materials were analyzed separately. A full domestic assemblage typical of Mississippian sites in the region is present, and the ceramics are consistent with the late Mississippian occupation span indicated by the radiocarbon dates.

A functional study of 259 diagnostic sherds (rims and large body sherds from the 1992–1994 seasons) shows that bowls (including pans at 9 percent) dominate the assemblage at 53 percent. Jars comprise 33 percent and bottles 7 percent of the sample. Miniature vessels (diameters less than 6 cm) comprise another 4 percent. Plates are very rare, at only 1.4 percent of the sample. There is one example of a bean-pot form and three crude pieces that may be stumpware (Thomas 1997:201). The latter might also be juice press fragments. The sherd assemblage from 1995 is about 87 percent shell tempered with shell mixes (grit or grog) comprising 9 percent and non-shell tempers (grog and/or grit) 4 percent. When calculated in terms of vessels, shell temper comprises 82 percent, shell mixes 6 percent, and non-shell temper 12 percent (Thomas 1994: 65). The vast majority of the sherds are plain, although a rare jar or plate exhibits decoration. Virtually the only incised decoration is Matthews Incised, varieties Manly and Beckwith (jars), and O'Byam Incised (plates) (see Phillips 1970:127–128, 144). Slipping or painting occur rarely. Thomas recorded one piece of negative painted ware. Most of the pans are plain but there are a few fabric-impressed pan fragments.

Subsistence Remains

From the presence of used hoes and hoe-sharpening flakes, we know that the inhabitants themselves were farming. An examination of a small number of flotation samples, derived mostly from the refuse deposits, documented a fairly standard botanical assemblage for a Mississippian habitation (Cobb 2000:184–185; Newsom 1994); cultigens or potential cultigens include maize, cucurbits, bean, sumpweed, maygrass, and large cultivated chenopodium. Hickory nuts are well represented, and various fruits and berries also occur.

Preservation of faunal remains is quite variable over the site, with most of the sample deriving from the midden deposits around the rim of the hilltop. The trash mound at the south end of the site proved to be especially rich. Faunal remains have been examined by Stahl (1994) and Breitburg (1996)—see summary table in Cobb (2000:180–181). The faunal assemblage is quite diverse, dominated by deer, as expected, but with notable amounts of squirrel, dog, and a surprising array of fish, aquatic turtle, and waterfowl for a site located in a small headwater drainage. The aquatic fauna are of some interest because some of these come from habitats that are not close to the site. Habitats that would support large fish (including slackwater species) and waterfowl are minimally 8 to 10 km distant from the site. These specimens could potentially represent exchange with neighboring groups.

The botanical and faunal remains clearly support the interpretation of a permanent residential community engaging in the expected Mississippian subsistence pattern, ad-

justed to the circumstances of a small headwater valley. The floral and faunal spectra compare very favorably to the Chambers site (Rossen 1987; Tune 1987), a small Mississippian village located in an interior creek valley in nearby western Kentucky.

Lithic Production Estimates

Based on excavations at workshop sites near the Dover chert quarries in Stewart County, Tennessee, Gramly (1992) argued that Mississippian knappers engaged in sustained, full-time production of large bifaces. Gramly's arguments are, however, seriously flawed (see Muller [1997:337-340] for a critique). While the quantities of chert debris are impressive, the tool production estimates for Dillow's Ridge are fully compatible with a scenario of part-time, perhaps even seasonal, production. This is not the place for a detailed explication of production and time estimates, but the following summary is provided.

The evidence from Dillow's Ridge is that hoes and Ramey knives may have been produced in comparable numbers, so the data on hoes and knives were averaged. Even if it is difficult to assess the relative proportions produced of each biface type, the key parameters in the estimate were set conservatively so that tool output would, if anything, be overestimated. Gramly (1992) provides statistics for large-biface production by experienced knappers using Dover chert. The debitage weights resulting from replicating Dover tools were 1,259 g for hoes, 1,624 g for large knives, and 925 g for flat adzes (Gramly 1992:87). The data on Mill Creek chert implements are more limited. Cobb (1988:220-223) describes the manufacture of two Mill Creek hoe-like implements (size and nature of nodule unspecified) with a mean debitage weight of 744 g. Dover chert usually occurs in thicker nodules than Mill Creek chert so that the manufacture of Mill Creek items would be expected to yield lower weights of debitage. The mean debitage weight from the two Mill Creek hoes is comparable to that of one of the Dover hoes made from a split slab (thinner than a nodule) so it was concluded that 800 g was probably a viable debitage estimate for a Mill Creek hoe. If a debitage ratio comparable to Dover hoes and knives holds for Mill Creek tools, then the average debitage weight resulting from knife manufacture would be around 1,000 g. For the estimate, the average debitage weight resulting from the manufacture of a large Mill Creek biface was set at the higher value of 1,000 g. This is above the average of the two tool types but it allows for flakes resulting from rejects, tool failures, and recycling.

Using data from a 5-m grid systematic auger survey, supplemented by excavation data, we derived an estimate of slightly over 86,000 kg (95 tons) of debitage on the site. This weight refers only to flake debris and does not include primary forms, rejects, or tool fragments other than retouched flakes. Averaging these numbers over a 200 year occupation span results in a mean annual output of 432 large bifaces (of all types) per year, with a total output of 86,400 for the life span of the settlement. Obviously, biface production was not constant, but we have no way to realistically apportion the village output through time.

The average times required for large-biface production by experienced knappers using Dover chert are 1 hour for hoes and 4.5 hours for Ramey knives (Gramly 1992:82). The average time for the manufacture of the two Mill Creek hoes was 2.17 hours, and a conservative value of 3 hours per large Mill Creek biface was used. With 3 hours as the average time required for producing a large biface, a group of only five knappers working modest 8-hour days could account for the estimated annual production in only 33 days. If the num-

ber of producers is, say, 10, then the entire annual output of the site could have been produced in little more than two weeks of work. Even if only one skilled knapper was resident on the site at any one time (a most unlikely circumstance), the annual output still represents an average daily output of only 1.2 bifaces. Using a different set of assumptions, Cobb (2000:148–149) devised a separate estimate of hoe production at the site, and his numbers are of comparable magnitude.

The issue of the annual output from the site is complicated by the fact that not all of the lithic production of the site's inhabitants is necessarily on this site. Some lithic production may have taken place at the quarries and on nearby workshops in the adjacent creek valley, but it does not appear to have a great amount. There is relatively little reduction debris at the main quarry site compared to many other quarries and that is concentrated at the west end of the site, the part closest to Dillow's Ridge. Also, there is only one workshop site between the quarry and the site, a small workshop exposed in the creek bed at the foot of the hill where Dillow's Ridge is located. Of course, neither the reduction debris at the quarry nor the workshop at the base of the hill are dated, and thus may or may not be contemporaneous with the village. Further, the presence of large cortical flakes in the village deposit attests to the fact that minimally trimmed nodules were being brought directly to the site.

Still, even if we increase these estimates to account for offsite production and the time required for quarrying and transporting the raw material, that does not change the fact that the predicted levels of tool production are quite modest and entirely consistent with relatively low levels of time input, when viewed within the context of an entire year. Obviously, one can manipulate the various parameters to alter the specific results; the key point, however is the *magnitude order* of the estimates. The average annual output at this site was in the hundreds of large biface tools, not the thousands.

Overview and Discussion

Dillow's Ridge is both a small residential village or hamlet and a workshop where Mill Creek chert tools, primarily hoes and Ramey knives, were produced for nonlocal consumption. The scale of that production was relatively modest, however, requiring only part-time effort of a relatively small number of knappers. The time devoted to lithic production by certain members of the community, while not insignificant, was not large enough to cause a fundamental restructuring of social and economic relations within the kin group or the village. This site was, of course, not the only site in the source locality where such products were produced. In social and political terms, Dillow's Ridge is clearly an outlier of the Hale site, the small mound center located 2.5 km to the east. No radiometric dates are available for Hale, but the Smithsonian investigation of that site (Cobb 1989; Thomas 1894) makes it clear that Hale is late Mississippian and broadly contemporaneous with Dillow's Ridge. The Hale site also evidences much workshop activity (Thomas 1894) and given the number of workshop sites in the locality, some of these are likely to be contemporaneous with Dillow's Ridge and Hale.

The location of Dillow's Ridge is notable on two counts. The site's location is such that its occupants could monitor and control access to the largest of the documented Mill Creek quarries. It is impossible that other parties could have removed chert from this

quarry and undertaken workshop activity in the vicinity without the knowledge and approval of the adjacent resident community. Second, the hilltop location suggests that defense was a concern. The valley floor of You Be Hollow Creek is relatively broad and could easily accommodate this habitation site. There was no topographic need to place the site on a steep, waterless hilltop. Clearly, the group residing in the source locality was concerned about controlling access to the quarry site as well as the threat of interlopers and even hostile raids. Fortification *per se* does not seem to have been a major concern. The existence of a palisade is not conclusively demonstrated, but even if it does exist, the site was palisaded for only a short time during its existence, most likely during the early phase of occupation.

Such concerns do not mean, however, that the production of hoes and other tools was centrally controlled or directed by a local elite. Nor was it likely an individual enterprise. Indeed, we suspect that production decisions and organization probably operated at the kin-group (lineage or clan) level. The scale and mechanics of digging the shafts at the quarry site required more labor than an individual family could reliably supply, and the transport of the raw material to workshops was much more efficient if group labor was involved.

The timing of the onset of the Dillow's Ridge occupation (and presumably also that of Hale) in the late 1200s A.D. is also significant. Prior to this, there is no good evidence for a significant residential presence in the chert-source locality; a survey of portions of the area has failed to find any sites of a comparable scale, although workshops are common (Cobb 2000). This suggests that, before the 1200s A.D., groups were coming into the locality for short periods of time to extract chert and produce blanks and preforms, but were not residing year-round in the area. It is also in this late 1200s time frame that we see other small Mississippian groups leaving areas along or near the Ohio River and shifting into the uplands to found new settlements in the headwaters of tributary drainages (Butler and Cobb 2001). Thus, although the selection of the chert source locality clearly reflects a concern for controlling a specific resource, the residential shift to a small interior valley may well reflect a broader regional pattern.

The relationship of Hale and Dillow's Ridge to the large Linn site (Cobb 1991) 10 km to the west is not clear. Mill Creek nodules were carried there and some large-biface production did take place at Linn. More important, the inhabitants of the Linn site may have controlled the flow of Mill Creek chert goods up and down the Mississippi Valley, especially northward to the American Bottom. It is not certain, however, that these sites are fully contemporaneous. Linn has a major emergent Mississippian (Dillinger) component (Cobb 1991), and its peak period may end before A.D. 1300, although stone-box graves, considered to generally post-date 1200 in this area, were found on the bluffs east of the site. There was doubtless some overlap between Linn and Hale (and its outliers), but when the Hale site was established, Linn may no longer have been an important site. It is even possible that Hale may be the successor to Linn as the dominant local center. Additional chronological information is obviously needed for both the Hale and Linn sites.

The occupants of the American Bottom were major consumers of Mill Creek chert products beginning in Emergent Mississippian times (see Brown et al. 1990; Kelly 1991a, 1991b), but there is no evidence that the Cahokia elites ever controlled the source locality in any meaningful sense. Indeed, there are both practical reasons why (Pauketat and Emerson 1997:274) and distributional evidence (Muller 1997:368-70) that that was never the case. Indeed, by the beginning of Dillow's Ridge, Cahokia had waned considerably and the

American Bottom demand for Mill Creek chert tools would have been significantly reduced.

All the available evidence suggests that the Hale site polity was an independent group ensconced at the source locality, with major trade linkages into both the Mississippi and Ohio river valleys. Curiously, their control over such an important lithic resource did not make the inhabitants of the Mill Creek source area either wealthy or powerful, at least in terms of the archaeological indicators of such things commonly manifested in other Mississippian regions (see Cobb 2000:154–157). This group was still supplying hoes and other large bifaces to Mississippian settlements along the lower Ohio River and, to a lesser extent, to southeast Missouri (O'Brien 1994:357) well into the 1400s. Indeed, as long as there was Mississippian settlement in the larger region, Mill Creek chert tools, especially hoes, were being used.

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